DEER CREEK WATER EXCHANGE PILOT PROGRAM SUMMARY REPORT

APPENDIX E:

- WATER QUALITY RESULTS

Deer Creek Water Exchange Pilot Program				
Date	**Time**	**Location**	**EC**	**Temp.**
5/23/2003	11:00 AM	Pilot Well at Discharge Line	135	60.4
5/28/2003	9:30 AM	Pilot Well at Discharge Line	158	64.9
6/3/2003	11:02 AM	Pilot Well at Discharge Line	146	66.3
6/5/2003	9:52 AM	Pilot Well at Discharge Line	141	64.6
6/12/2003	8:50 AM	Pilot Well at Discharge Line	155	62.1
6/24/2003	1:30 PM	Pilot Well at Discharge Line	148	65.2
7/2/2003	10:25 AM	Pilot Well at Discharge Line	142	64.2
7/7/2003	4:30 PM	Pilot Well at Discharge Line	141	63.8
7/11/2003	1:30 PM	Pilot Well at Discharge Line	143	65.3
7/18/2003	6:30 AM	Pilot Well at Discharge Line	146	63.0
7/27/2003	7:00 AM	Pilot Well at Discharge Line	146	63.5
8/19/2003	1:25 PM	Pilot Well at Discharge Line	139	64.1
8/28/2003	10:50 AM	Pilot Well at Discharge Line	167	64.0
5/23/2003	11:00 AM	DCID Canal upstream from Pilot Well Discharge	177	70.1
5/28/2003	9:35 AM	DCID Canal upstream from Pilot Well Discharge	119	63.6
6/3/2003	11:06 AM	DCID Canal upstream from Pilot Well Discharge	123	65.2
6/5/2003	9:58 AM	DCID Canal upstream from Pilot Well Discharge	122	66.0
6/12/2003	8:50 AM	DCID Canal upstream from Pilot Well Discharge	105	66.1
6/24/2003	1:30 PM	DCID Canal upstream from Pilot Well Discharge	112	74.8
7/2/2003	10:25 AM	DCID Canal upstream from Pilot Well Discharge	130	62.8
7/7/2003	4:30 PM	DCID Canal upstream from Pilot Well Discharge	129	80.4
7/11/2003	1:30 PM	DCID Canal upstream from Pilot Well Discharge	131	63.3
7/18/2003	6:30 AM	DCID Canal upstream from Pilot Well Discharge	129	71.2
7/11/2003	7:00 AM	DCID Canal upstream from Pilot Well Discharge	132	72.6
8/19/2003	1:25 PM	DCID Canal upstream from Pilot Well Discharge	152	82.0
8/28/2003	10:50 AM	DCID Canal upstream from Pilot Well Discharge	124	61.6
9/9/2003	12:10 PM	DCID Canal upstream from Pilot Well Discharge	133	61.3
Note: EC is reported in microseimens per liter. Temp is reported in degrees Farenheit				

Table 1 Temperature and Electrical Conductivity Measurements at the Pilot Well (24N01W-04M01) and the DCID Canal

Deer Creek Water Exchange Pilot Program										
WATER QUALITY CONSTITUENTS	SAMPLE DATE,TIME AND LOCATION									
	2/19/03 9:00	5/29/03 9:00			7/21/03 9:00			9/2/03 15:15		
	Pilot Well	Pilot Well	Canal US	Canal DS	Pilot Well	Canal US	Canal DS	Pilot Well	Canal US	Canal DS
MINERALS										
Temp C	16.6	18.9	16.6	19.4	16.1	24.7	23.2	16.1	22.6	21.3
Temp. F	61.8	66.0	61.8	66.0	60.9	76.4	73.7	61.0	72.7	70.3
pH (field)	8.2	7.9	8.1	7.8	8.1	7.6	7.9	7.9	8.1	7.9
pH (lab)	8.2	6.6	6.2	6.3	6.4	6.2	6.3	6.2	6.2	6.2
EC (field)	157	103	158	88	161	146	149	139	151	153
EC (lab)	155	141	77	94	154	141	145	156	148	149
Dissolved K (mg/L)	1.8	1.6	1.0	1.1	1.7	2.2	1.9	1.7	1.9	1.8
Dissolved Na (mg/L)	9	8	4	5	9	10	9	9	11	10
Dissolved CA (mg/L)	11	10	7	8	10	10	10	11	11	10
Dissolved Mg (mg/L)	9	8	4	5	8	6	7	9	7	7
Total Alkalinity (as CaCO3)	82	83	47	55	83	72	74	80	74	75
SAR	0.5	0.5	0.3	0.3	0.5	0.6	0.5	0.5	0.6	0.6
ASAR	0.6	0.6	0.2	0.3	0.6	0.7	0.6	0.6	0.7	0.7
Dissolved SO4 (mg/L)	2	2	<0.1	<0.1	2	2	2	2	2	2
Dissolved Cl (mg/L)	3	3	1	2	3	4	3	3	4	4
Dissolved NO3 (mg/L)	0.4	0.7	<0.01	0.02	0.08	0.02	0.02	0.42	0.41	0.21
Total Dis. Solids (@ 180 F)	96	101	56	64	103	92	95	92	101	99
Dis. Hardness (mg/L as CaCO3)	65	58	34	41	58	50	54	65	56	54
Total Hardness (mg/L as CaCO3)	65	58	34	41	65	52	56	65	56	56
Dissolved Boron (mg/L)	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.1	<0.1	0.1	0.1
Turbidity (NTU)	0.2	0	2.5	2.2	0	24.7	12.6	0.1	6.2	4.1
Dis. Carbonate (mg/L)	<1	<1	<1	<0.1	<1	<1	<1	<1	<1	<1
Dis. Bicarbonate (mg/L)	82	83	47	55	83	72	74	80	74	75
Dis. Hydroxide (mg/L)	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

Table 2 Minerals Water Quality Data from the Pilot Well, DCID Canal Upstream and Downstream of Pilot Well Discharge.

Deer Creek Water Exchange Pilot Program										
WATER QUALITY CONSTITUENTS	SAMPLE DATE,TIME AND LOCATION									
	2/19/03 9:00	5/29/03 9:00			7/21/03 9:00			9/2/03 15:15		
	Pilot Well	Pilot Well	Canal US	Canal DS	Pilot Well	Canal US	Canal DS	Pilot Well	Canal US	Canal DS
METALS (total)										
Aluminum (µg/L)	6.5	3.76	105.3	11.2	4.78	565	486	6.32	250	132
Arsenic (µg/L)	1.42	1.84	2.12	2.09	1.83	6.12	5.47	1.82	7.88	6.83
Cadmium (µg/L)	<0.008	<0.005	<0.005	<0.005	<0.016	<0.16	<0.16	<0.01	<0.01	<0.01
Chromium (µg/L)	0.27	1.81	1.14	1.31	0.633	2.31	1.99	0.89	1.01	0.83
Copper (µg/L)	0.06	0.109	0.366	0.294	0.366	1.28	1	0.13	0.64	0.39
Iron (µg/L)	5	<4.34	120	95.9	<5.56	690	592	<3.1	314	174
Lead (µg/L)	<0.015	0.046	0.055	0.034	<.002	0.259	0.187	<.007	0.1	0.51
Manganese (µg/L)	0.51	0.138	4.99	4.04	0.094	27.7	21.6	0.31	21.5	8.18
Mercury (ng/L)	<0.15	<0.15	0.64	0.47	<0.15	1.51	1.24	<0.15	0.83	0.52
Nickel (µg/L)	<0.04	<0.106	0.192	0.141	<0.276	1.27	1.1	0.27	0.84	0.65
Selenium (µg/L)	<0.30	<0.258	<0.258	<0.258	<0.242	<0.242	<0.242	<0.21	<0.242	<0.242
Zinc (µg/L)	<0.10	1.17	4.06	0.316	<0.071	1.63	1.09	<0.066	0.65	0.37
Ag (Silver) (µg/L)	<0.015	<0.21	<0.21	<0.21	<0.106	<0.106	<0.106	<0.144	<0.106	<0.106
NUTRIENTS										
Dis. NO2+NO3 (mg/L)	0.07	0.07	<0.1	0.02	0.08	0.02	0.02	Waiting	on	Results
Dis NH3 (mg/L)	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	<0.01	Waiting	on	Results
Total NH3 (mg/L)	ND	ND	0.24	ND	ND	0.27	ND	ND	ND	ND
Dis. Ortho-PO4 (mg/L)	0.04	0.04	<0.1	0.02	0.05	0.03	0.03	Waiting	on	Results
Total Phosphorous (mg/L)	0.04	0.05	0.02	0.03	0.05	0.07	0.08	Waiting	on	Results

Table 3 Metals and Nurtient Water Quality Data from the Pilot Well, DCID Canal Upstream and Downstream of Pilot Well Discharge.

Constituent or Parameter (Synonym)	Water Quality Objective or Promulgated Criterion	Recommended Numerical Limits			G = Groundwater IS = Inland Surface Water
		Source / Averaging Period	Limit	Units	
Aluminum	Chemical Constituents	California Primary MCL	1000	ug/L	G & IS
		California Secondary MCL	200	ug/L	G & IS
		Water Quality for Agriculture (Ayers & Westcot)	5000	ug/L	G & IS
	Tastes and Odors	California Secondary MCL	200	ug/L	G & IS
	Toxicity - humans	California Public Health Goal for Drinking Water	600	ug/L	G & IS
	Toxicity - aquatic life	USEPA National Recomm. W Q Criteria / 4-day avg (total) (f)	87	ug/L	IS
		USEPA National Recomm. W Q Criteria / 1-hour avg (total)	750	ug/L	IS
Arsenic	Chemical Constituents	California Primary MCL	50	ug/L	G & IS
		USEPA Primary MCL	10	ug/L	G & IS
		Water Quality for Agriculture (Ayers & Westcot)	100	ug/L	G & IS
	Toxicity - humans	Cal/EPA Cancer Potency Factor as a drinking water level (b)	0.023	ug/L	G & IS
		USEPA National Ambient Water Quality Criteria	0.018	ug/L	IS
	CTR - aquatic life	Californa Toxics Rule (USEPA) / 4-day average (dissolved)	150	ug/L	IS
		Californa Toxics Rule (USEPA) / 1-hour average (dissolved	340	ug/L	IS
Cadmium	Chemical Constituents	California Primary MCL	5	ug/L	G & IS
		Water Quality for Agriculture (Ayers & Westcot)	10	ug/L	G & IS
	Toxicity - humans	California Public Health Goal for Drinking Water	0.07	ug/L	G & IS
	CTR - aquatic life	Californa Toxics Rule (USEPA	see Page 19 tab		IS
Chromium (III)	Chemical Constituents	California Primary MCL	see Cr (total)		G & IS
	Toxicity - humans	USEPA IRIS Reference Dose (c)	10,500	ug/L	G & IS
	NTR - aquatic life	National Toxics Rule (USEPA	see Page 21 tab		IS
Chromium (VI)	Chemical Constituents	California Primary MCL	see Cr (total)		G & IS
		Water Quality for Agriculture (Ayers & Westcot)	100	ug/L	G & IS
	Toxicity - humans	USEPA IRIS Reference Dose (c)	21	ug/L	G & IS
	CTR - aquatic life	Californa Toxics Rule (USEPA) / 4-day average (dissolved)	11	ug/L	IS
		Californa Toxics Rule (USEPA) / 1-hour average (dissolved	16	ug/L	IS
Chromium (total	Chemical Constituents	California Primary MC	50	ug/L	G & IS
Copper	Chemical Constituents	California Primary MCL	1300	ug/L	G & IS
		California Secondary MCL	1000	ug/L	G & IS
		Water Quality for Agriculture (Ayers & Westcot)	200	ug/L	G & IS
	Tastes and Odors	California Secondary MCL	1000	ug/L	G & IS
	Toxicity - humans (a)	California Public Health Goal for Drinking Water	170	ug/L	G
	CTR - humans	Californa Toxics Rule (USEPA) for sources of drinking water	1300	ug/L	IS
	CTR - aquatic life	Californa Toxics Rule (USEPA	see Page 23 tab		IS
Iron	Chemical Constituents	California Secondary MCL	300	ug/L	G & IS
		Water Quality for Agriculture (Ayers & Westcot)	5000	ug/L	G & IS
	Tastes and Odors	California Secondary MCL	300	ug/L	G & IS
	Toxicity - aquatic life	USEPA National Ambient W Q Criteria / 4-day averag	1000	ug/L	IS
Lead	Chemical Constituents	California Primary MCL	15	ug/L	G & IS
		Water Quality for Agriculture (Ayers & Westcot)	5000	ug/L	G & IS
	Toxicity - humans	California Public Health Goal for Drinking Water	2	ug/L	G & IS
	CTR - aquatic life	California Toxics Rule (USEPA	see Page 24 tab		IS
Manganese	Chemical Constituents	California Secondary MCL	50	ug/L	G & IS
		Water Quality for Agriculture (Ayers & Westcot)	200	ug/L	G & IS
	Tastes and Odors	California Secondary MCL	50	ug/L	G & IS
	Toxicity - humans	California DHS Action Level for drinking water	500	ug/L	G & IS
Mercury	Chemical Constituents	California Primary MCL	2	ug/L	G & IS
(see also Methylmercury)	Toxicity - humans (a)	California Public Health Goal for Drinking Water	1.2	ug/L	G
	Toxicity - aquatic life	USEPA National Ambient W Q Criteria / 4-day average	0.77	ug/L	IS
		USEPA National Ambient W Q Criteria / 1-hour average	1.4	ug/L	IS
	CTR - humans	Californa Toxics Rule (USEPA) for sources of drinking water	0.05	ug/L	IS
Methylmercury	Toxicity - humans	USEPA IRIS Reference Dose (c)	0.07	ug/L	G & IS
		USEPA National Ambient W Q Criteria (fish tissue	0.3	mg/kg	IS
Nickel	Chemical Constituents	California Primary MCL	100	ug/L	G & IS
		Water Quality for Agriculture (Ayers & Westcot)	200	ug/L	G & IS
	Toxicity - humans (a)	California Public Health Goal for Drinking Water	12	ug/L	G
	CTR - humans	Californa Toxics Rule (USEPA) for sources of drinking water	610	ug/L	IS
	CTR - aquatic life	Californa Toxics Rule (USEPA; dissolved	see Page 25 tab		IS
Selenium	Chemical Constituents	California Primary MCL	50	ug/L	G & IS
		Water Quality for Agriculture (Ayers & Westcot)	20	ug/L	G & IS
	Toxicity - humans	USEPA IRIS Reference Dose (c)	35	ug/L	G & IS
	NTR - aquatic life	National Toxics Rule (USEPA) / 4-day average (total)	5	ug/L	IS
		National Toxics Rule (USEPA) / 1-hour average (tota	20	ug/L	IS
Silver	Chemical Constituents	California Secondary MCL	100	ug/L	G & IS
	Tastes and Odors	California Secondary MCL	100	ug/L	G & IS
	Toxicity - humans	USEPA IRIS Reference Dose (c)	35	ug/L	G & IS
	CTR - aquatic life	Californa Toxics Rule (USEPA	see Page 28 tab		IS
Zinc	Chemical Constituents	California Secondary MCL	5000	ug/L	G & IS
		Water Quality for Agriculture (Ayers & Westcot)	2000	ug/L	G & IS
	Tastes and Odors	California Secondary MCL	5000	ug/L	G & IS
	Toxicity - humans	USEPA IRIS Reference Dose (c)	2100	ug/L	G & IS
	CTR - aquatic life	Californa Toxics Rule (USEPA	see Page 30 tab		IS

Note: Based on a Compilation of Water Quality Goals established by California Regional Water Quality Control Board, Central Valley Region

(a) For surface waters, this limit may be preempted by a Calfornia Toxics Rule or National Toxics Rule criterion.

(b) Assumes 70 kg body weight and 2 liters per day drinking water consumption.

(c) Assumes 70 kg body weight, 2 liters per day drinking water consumption, and 20 percent relative source contrubution. An additional undertainty factor of 10 is used for Class C carcinogens.

(d) Applies to "TCDD Equivalents" calculated from the concentrations of 2,3,7,8-chlorinated dibenzodioxins and 2,3,7,8-chlorinated dibenzofurans and their corresponding toxic equivalency factors (TEFs).

(e) Applies separately to Aroclors 1242, 1254, 1221, 1232, 1248, 1260, and 1016.

(f) USEPA, Region 9 has allowed acid soluble to account for suspended clay partices in receiving water.

(g) Potency Equivalency Factors, published by the Cal/EPA Office of Enviornmental Health Hazard Assessment, relate the relative cancer potencies of various polynuclear aromatic hydrocarbons to that of benzo(a)pyrene.

CTR California Toxics Rule

MFL Million fibers per liter; limited to fibers longer than 10 um.

NTR National Toxics Rule

Table 4. RWQCB Recommended Numerical Water Quality Limits for Metals